

171-5 PROJECTIONS OF WASTE QUANTITIES

5-1 INTRODUCTION

This section provides information regarding the quantity of solid waste expected to be generated in the future, along with projections of how much of that waste will be recycled, composted and disposed. These projections are critical to the planning of facilities and programs necessary to effectively manage solid waste in Rhode Island and meet the goals established in this Plan. The methodology utilized to develop these projections, and the assumptions employed are described in this section, along with the results of the projections. The many factors that can affect these projections are discussed, and the programs and facilities necessary to support the projected levels of source reduction, recycling, composting, and disposal are described in Chapter 8.

5-2 CURRENT LEVELS OF WASTE GENERATED, RECYCLED, COMPOSTED AND DISPOSED

The starting point for any projection of waste quantities must be the current status of solid waste management. In addition to establishing the current quantities of waste generated, recycled, composted and disposed, a judgement must be made as to whether or not the current quantities are anomalous. In other words, it must be determined if the conditions that caused the current status are unusual and temporary, which would mean that the current status would not be a good starting point for a long-term projection. It is fortunate that for this Plan there is sufficient data not only to assess the current status of solid waste management with reasonable accuracy, but also to determine if the current status is consistent with historic data.

There are two main categories of solid waste that will be addressed in these projections: municipal and commercial waste. Municipal waste is that waste which the municipalities have responsibility to collect, which is primarily waste generated at residences, although certain institutional wastes, such as that generated by public schools, are often included. Commercial waste is the remainder of the solid waste, and since it is not the responsibility of municipalities to collect this waste, businesses and other waste generators contract with private collection companies for this service. Since these waste streams are different in terms of their composition, management and entity responsible for collection, they are addressed separately in these projections, although the results are eventually combined to describe the management of the combined solid waste stream.

5-2-1 Current Status of Municipal Waste Management

For the purposes of this Plan, the "current" status of solid waste management refers to the status in 1994, since that is the last full year for which records are available. In 1994, 388,872 tons of municipal waste was disposed at the Landfill, and Table 171-5 (1) shows the quantity disposed on a town-by-town basis. In addition 59,918 tons of recyclable material were received at the Corporation's MRF, and Table 171-5 (1) also shows this data for each community.

It is also known that significant composting of yard waste occurred in 1994. However, this is one area of solid waste management in which accurate data concerning volume is lacking. As a result it was not possible to develop an accurate town-by-town accounting of the yard waste composting that occurred in 1994. Discussions with Corporation and DEM personnel most familiar with the status of composting confirmed that a reasonable assumption was that in 1994 40 percent of the leaves generated and 10 percent of the grass and other yard waste was composted, on a statewide basis. Using those assumptions, a statewide total for composting was estimated and that total was allocated amongst all municipalities based on their relative population. In other words, if a given community represents 2 percent of the total statewide population, it was assumed to compost 2 percent of the statewide total estimate of yard waste composted. These results are shown in Table 171-5 (1).

These quantities of waste disposed, recycled and composted can be summed to determine total waste generation, as is also shown in Table 171-5 (1). This yields a total of 454,544 tons generated. However, this does not represent statewide municipal waste generation, since there are several communities that did not take all of their municipal waste to the Landfill in 1994. Thus, in order to estimate total statewide waste generation, the data from the Landfill must be extrapolated. This is done by calculating the waste generation per-capita for those communities that did bring all of their waste to the Landfill in 1994, and applying the per-capita waste generation rate to those communities that did not. As is shown in Table 171-5 (1), the per capita waste generation rate was calculated to be approximately 0.47 tons per person per year. When this is applied to those communities that did not bring all of their waste to the Landfill, the total statewide municipal waste generation is estimated to be approximately 483,500 tons.

Table 171-5 (1)

TABLE 171-5 (1)
1994 QUANTITIES OF WASTE RECYCLED, COMPOSTED AND DISPOSED.
TOWN-BY-TOWN

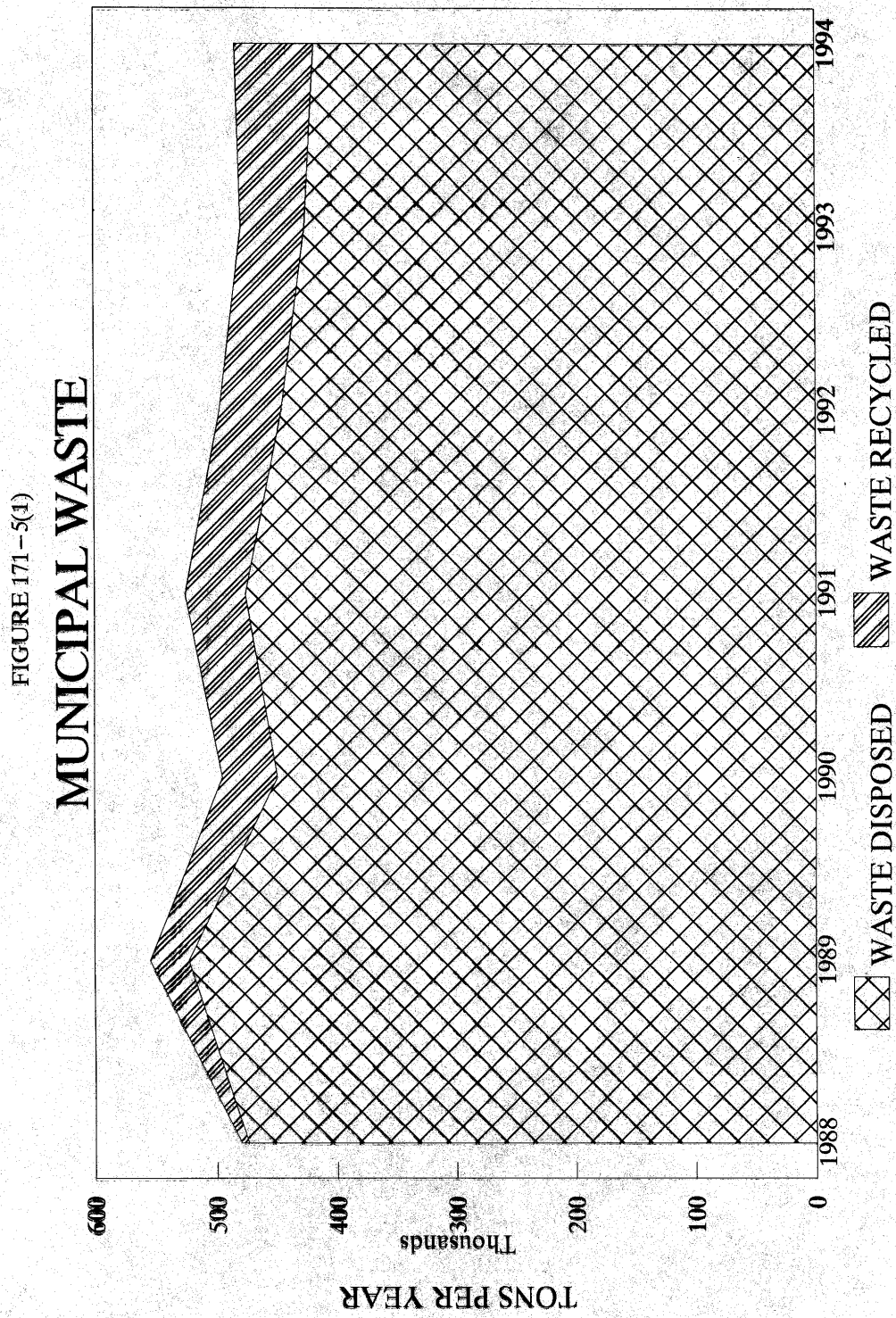
HISTORIC DATA	MUNICIPAL SEP FOR RECYCLING	COMPOSTED	GENERATEE	PER CAPITA	FULL YEAR AT CLF	GENERATED (FULL YEAR DATA ONLY)	WASTISHED POPULATION	STATE- WIDE WASTE GENERATION	FULL YEAR RECYCLING (Y/N)	MUNICIPAL RECYCLING RATE	RECYCLED/ COMPOSTED (FULL YEAR RECY ONLY)	GENERATED (FULL YEAR RECY ONLY)
MUNICIPALITIES	DISPOSED											
BARRINGTON	6,922	950	7,963	0.49	Y	7,963	16,089	7,963	Y	11.93%	1,041	7,963
BRISTOL	3	1,571	1,698	0.08	N	0	0	10,420	Y	15.08%	1,695	10,420
BURRILLVILLE	5,969	807	6,869	0.42	Y	6,869	16,476	6,869	Y	11.75%	900	6,869
CENTRAL FALLS	5,927	599	6,627	0.37	Y	6,627	17,904	6,627	Y	9.04%	700	6,627
CHARLESTOWN	725	184	946	0.14	N	0	0	3,121	Y	5.89%	221	3,121
COVENTRY	12,867	2,544	15,489	0.49	Y	15,489	31,554	15,489	Y	15.13%	2,522	15,489
CRAWFORD	30,025	436	36,666	0.47	Y	36,666	77,213	36,666	Y	16.92%	6,641	36,666
CUMBERLAND	13,014	2,361	15,542	0.53	Y	15,542	29,478	15,542	Y	13.19%	2,528	15,542
EAST GREENWICH	5,361	1,149	6,578	0.55	Y	6,578	12,045	6,578	Y	17.47%	1,217	6,578
EAST PROVIDENCE	18,429	3,569	22,287	0.44	Y	22,287	51,144	22,287	Y	16.01%	3,858	22,287
EXETER	2,719	371	3,121	0.56	Y	3,121	5,544	3,121	Y	11.89%	402	3,121
FOSTER	2,122	90	2,237	0.51	Y	2,237	4,381	2,237	N	0.00%	25	0
GLOUCESTER	3,297	666	4,016	0.43	Y	4,016	9,367	4,016	Y	16.58%	719	4,016
HOPKINTON	0	0	39	0.01	Y	39	6,977	39	N	0.00%	39	0
JAMESTOWN	3,271	631	3,931	0.77	Y	3,931	5,075	3,931	Y	16.05%	660	3,931
JOHNSTON	13,065	1,940	15,157	0.56	Y	15,157	26,944	15,157	Y	12.80%	2,092	15,157
LINCOLN	7,376	1,513	8,992	0.49	Y	8,992	18,319	8,992	Y	16.83%	1,616	8,992
LITTLE COMPTON	2,394	44	2,457	0.72	Y	2,457	3,590	2,457	N	0.00%	19	0
MIDDLETOWN	1,611	256	1,979	0.10	N	0	0	9,377	Y	2.73%	368	9,377
NARRAGANSETT	380	0	466	0.03	Y	466	15,212	466	N	0.00%	86	0
NEWPORT	12,968	2,895	16,025	0.56	Y	16,025	28,655	16,025	Y	18.07%	3,057	16,025
NEW SHOREHAM	1,318	0	1,323	1.56	Y	1,323	849	1,323	N	0.00%	5	0
NORTH KINGSTOWN	9,071	2,031	11,238	0.47	Y	11,238	24,147	11,238	Y	18.07%	2,167	11,238
NORTH PROVIDENCE	17,867	0	184	0.55	Y	18,051	32,577	18,051	Y	0.00%	184	18,051
NORTH SMITHFIELD	3,291	985	4,336	0.41	Y	4,336	10,656	4,336	Y	22.72%	1,045	4,336
PAWTUCKET	28,160	4,320	32,897	0.45	Y	32,897	73,746	32,897	Y	13.13%	4,737	32,897
PORTSMOUTH	3,058	5	3,160	0.18	N	0	0	8,123	N	0.00%	97	0
PROVIDENCE	69,064	7,092	77,078	0.47	Y	77,078	163,165	77,078	Y	9.20%	8,014	77,078
RICHMOND	826	240	1,097	0.20	Y	1,097	5,452	1,097	Y	21.88%	271	1,097
SCITUATE	4,654	0	4,710	0.47	Y	4,710	9,945	4,710	N	0.00%	56	0
SMITHFIELD	6,711	1,501	8,322	0.43	Y	8,322	19,454	8,322	Y	18.04%	1,611	8,322
SOUTH KINGSTOWN	11,371	698	12,210	0.49	Y	12,210	25,004	12,210	Y	5.72%	839	12,210
SOUTH TIVERTON	0	1,091	1,173	0.08	N	0	0	6,896	Y	15.82%	1,173	6,896
WARREN	6,177	843	7,085	0.61	Y	7,085	11,558	7,085	Y	11.90%	908	7,085
WARWICK	31,656	6,956	39,102	0.45	Y	39,102	86,722	39,102	Y	17.79%	7,446	39,102
WESTERLY	16,656	1,699	18,479	0.84	Y	18,479	21,933	18,479	Y	9.19%	1,823	18,479
WEST GREENWICH	1,714	277	2,011	0.57	Y	2,011	3,545	2,011	Y	13.77%	297	2,011
WEST WARWICK	12,493	1,878	14,539	0.49	Y	14,539	29,712	14,539	Y	12.92%	2,046	14,539
WOONSOCKET	16,240	2,157	18,649	0.42	Y	18,649	44,542	18,649	Y	11.57%	2,409	18,649
TOTALS	388,872	59,918	454,544			445,589	938,754	483,526		RECYCLING RATE FOR FULL-YEAR TOWNS:	65,533	464,171
						PER-CAPITA:	0.474659423				14.12%	

If one examines the current status of municipal waste management estimated in the analysis described above in the context of recent history, it can be seen that the current status is not anomalous and is a reasonable starting point for projections. Figure 171-5 (1) provides a graphical summary of the last seven years of municipal waste management. In this graph, recycling and composting are considered together, under the general heading of recycling. It can be seen that recycling has grown substantially over the last seven years, as would be expected, and that although total waste generation has gone up and down, the general trend since 1989 has been downward, and the 1994 estimate of municipal waste generation is certainly consistent with recent history.

Two interesting aspects of per-capita waste generation are worthy of discussion. The first is that the per-capita generation rate on a statewide basis has stayed within a relatively narrow bandwidth, but has decreased somewhat over the last several years.

The highest per-capita generation rate in the last seven years was 0.55 tons per person in 1989, and the current waste generation rate is 0.47 tons per person per year. Some of this decline may be due to economic factors, but it is likely that some of the decline was due to the success of source reduction efforts in the state. The second aspect of per-capita rates that should be noted is their variation from community-to-community. Some of this variation is due to communities combining some or all of their municipal waste in a transfer station. However, even for communities that take their waste separately to the State Landfill there is significant variation. This is to be expected as a result of differing waste generation patterns depending on household size and other demographic factors. In addition, many communities represent a relatively small population, and with small "sample sizes" one expects significant variation from sample-to-sample. The most important point is that the overall state generation rate has remained within a relatively small bandwidth, providing confidence in the consistency and accuracy of the data.

Figure 171-5 (1)



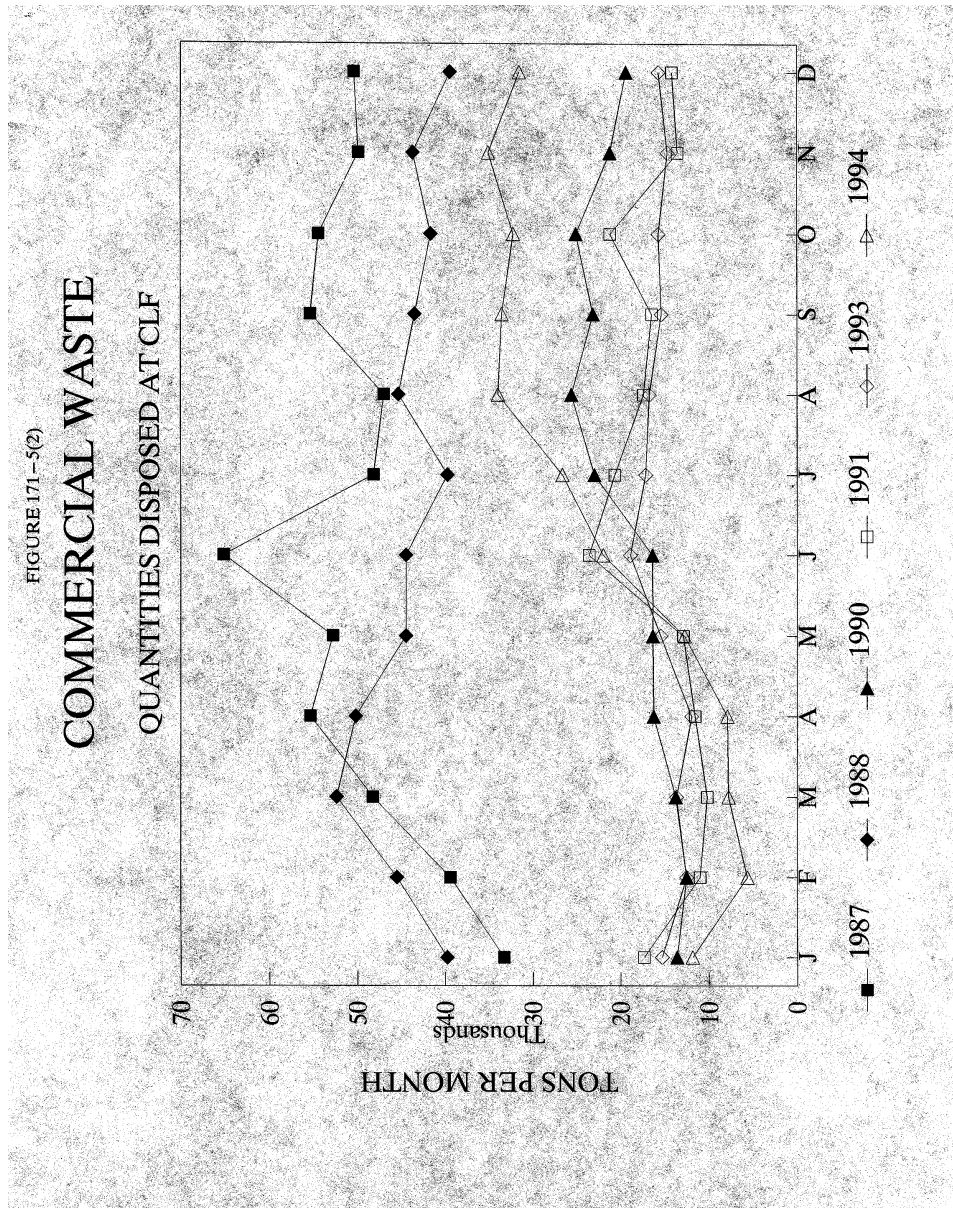
5-2-2 Current Status of Commercial Waste Management

There are two key differences in assessing the status of commercial waste management and that of municipal waste. The first is that the quantity of commercial waste disposed at the Landfill has fluctuated significantly over the last several years, compared to the relatively constant flow of municipal waste. The second key difference is that there is much less data characterizing commercial recycling than municipal recycling. The reasons for these differences are straightforward; the Corporation has no control over the flow of commercial waste, and so the quantities that are disposed at State Landfill are dependent on the regional disposal marketplace; and commercial recycling occurs in a non-centralized fashion making data difficult to come by.

Disposal

As a result of these differences, the estimation of the current status of commercial waste management differs from that for municipal waste in a number of aspects. Figure 171-5 (2) shows the month-by-month quantities of commercial waste disposed at State Landfill for six of the last eight years. This graph is designed to show the range of quantities that have been disposed at the State Landfill in the recent past. It can be seen that there are two bandwidths into which the quantities fall. In 1987 and 1988 commercial waste disposal was relatively high, and in 1990, 1991 and 1993 waste disposal was relatively low. Disposal quantities for 1994 do not fall into one of the two bandwidths. In the first half of 1994 disposal quantities were extraordinarily low, but in the last half of 1994 waste quantities were higher than they have been in six years.

Figure 171-5 (2)



In June of 1994 the Corporation offered new contracts for commercial waste disposal. While the tipping fee for commercial disposal did not change, the disposal marketplace had changed significantly during the previous 12 months. During 1994 a significant tightening of the disposal marketplace occurred in the Northeast. Waste quantities disposed increased significantly, certain disposal facilities in the region closed or were nearing closure, and tipping fees increased significantly. As a result, the \$37 per ton tipping fee offered by the Corporation had become much more competitive and attractive. Thus, much of the commercial waste that had been exported to disposal locations out-of-state in the first half of 1994 was disposed at the State Landfill in the last half of 1994.

This pattern of increased disposal quantities was not unique to the State Landfill. Throughout the Northeast quantities of waste disposed showed significant increases during 1994, and in particular in the last half of 1994. In addition, the disposal levels in the last half of 1994 were not considered an anomaly, and in fact some private disposal facility operators are predicting waste quantities to increase even further.

These patterns and observations must be turned into an estimate of the "current" status of commercial waste disposal to use as a starting point for projections. For the purposes of these projections, the last half of 1994 is considered to be representative of current conditions, and, once extrapolated to a full year, is reasonable to use as a starting point for projections. There are several key points in support of this assumption. The first is that the general consensus amongst solid waste management professionals in the region is that the conditions present in the last half of 1994 are likely to continue, at least for the foreseeable future. Second, in the area surrounding Rhode Island there is potential for reduction in disposal capacity in the next several years, further reducing the competition for Rhode Island-generated waste. Lastly, by looking at Figure 171-5 (2) it can be seen that the disposal quantities in the last half of 1994 fall in the middle of the two bandwidths experienced in the recent past, meaning that this level of disposal is likely a reasonable long-term average.

In the last six months of 1994, 192,904 tons of commercial waste were disposed at the State Landfill. Historically, during the period 1987 through 1993 the amount of waste disposed from July through December of each year has represented 49.4 percent of the total waste disposed annually. Using this percentage, the 192,904 tons disposed in the last six months of 1994 can be extrapolated to a full-year basis. The result of this calculation is an estimate of 390,800 tons disposed. This quantity is used as an estimate of 1995 commercial waste disposed, and represents the starting point for projections of commercial waste disposal.

It should be noted that although the estimate of 390,800 tons per year is deemed to be a reasonable starting point for projections, it does not represent a statewide estimate of commercial waste disposed. Even though the amount of waste exported from Rhode Island dropped dramatically in the last half of 1994, it is likely that a significant amount of waste continued to be exported. However, it is anticipated that the level of export experienced in the last half of 1994 is likely to continue at least in the short-term. As a result, the estimate of 390,800 tons per year represents the amount of waste expected to be managed within the Corporation's system.

Recycling

The estimate described above is for the amount of commercial waste remaining after recycling. Since there is no centralized facility used for the recycling of commercial waste, it is more difficult to determine the quantity of commercial waste recycled than for municipal waste. Initially, based on the lack of data, an estimate of commercial recycling was made based on general knowledge of commercial recycling in New England, anecdotal information about commercial recycling in Rhode Island, and discussions with DEM officials involved in monitoring commercial recycling in Rhode Island. This preliminary estimate was 35 percent.

There is, however, a source of quantitative data regarding the level of commercial recycling in Rhode Island. That source is the commercial recycling reports that businesses of a certain size are required to submit to DEM annually. When this data source was first examined its utility was not clear, due to the fact that not all businesses in Rhode Island have been required to report, and there are not reports for all businesses that have been required to submit reports. Nonetheless, this data represents activity that is actually occurring within Rhode Island businesses, and thus it was deemed worthy of consideration.

In order to utilize the data from commercial recycling reports, the data must be extrapolated to the entire business community. Table 171-5 (2) shows the data compiled from commercial recycling reports submitted to DEM. It can be seen that, for instance, 227 firms with 50 to 99 employees submitted recycling reports, with a total tonnage recycled of 27,930, resulting in an average tonnage of 123 tons per firm. This data is shown for three other categories of firm size. It can be seen that the average number of tons per firm increases with increases in the size of the firms, as would be expected.

Also shown in Table 171-5 (2) is data regarding the number of total firms and total employees in each size category. This data was derived from Bureau of Census estimates for 1992. It can be seen that for the 50 to 99 employee and 250 to 499 employee categories, there are many fewer reports than firms in existence. Some of this is due to lack of compliance with reporting requirements, but some of it is also due to the fact that DEM has not entered all of the data from reports into the database that was utilized in this analysis. In the case of the 100 to 249 employee category there are more reports than firms, but this is a result of combining two years of reporting data. For the 500 and above employee category there are more reports than firms and this may be due to the different ways in which the Census Bureau and business count employees.

Table 171-5 (2)

TABLE 171-5(2)
COMMERCIAL RECYCLING REPORT ANALYSIS

Size of Firm	No. of Firms Reporting	Total Tons Reported	Average Tons Per Firm	Total Firms in Category	Total Empl. in Category	Average Empl. Per Firm	Average Tons/Empl.	Total Tons for Category
50 - 99	227	27,930	123.0	643	44,084	68.6	1.79	79,114
100 - 249	384	61,326	159.7	365	54,901	150.4	1.06	58,292
250 - 499	59	17,781	301.4	104	36,599	351.9	0.86	31,343
500 +	80	66,904	836.3	65	73,807	1135.5	0.74	54,360
TOTALS				1,177	209,391			223,108

NOTE: Number of firms reporting and total tons reported in 100 - 249 employee category are totals for two years of data.

When the average number of employees in each firm is calculated for each business size category, this allows the determination of an average quantity of material recycled per employee for each category. The average number of tons recycled per firm from the report data is divided by the number of employees per firm from the Census Bureau data to determine tons recycled per employee per year. It can be seen that this quantity ranges from 0.74 tons per employee for the biggest firms to 1.79 tons per employee for the smallest firms. When these quantities are multiplied by the total number of employees in each category, an estimate of statewide commercial recycling for each business size category is derived.

Using this approach, it is estimated that 223,000 tons of commercial waste was recycled by the firms in the four size categories analyzed. Inherent in this calculation is the assumption that the firms in a given size category that did not report their recycling data (or whose data was not included in the database) recycled at the same rate as those that did report. This may be an optimistic assumption, since, presumably, those firms that are successfully recycling would be more inclined to submit reports than those that are not recycling or recycling in a limited way. However, this potential overestimation may be offset by the fact that the firms with fewer than 50 employees have not been required to submit reports, and therefore were not included in the analysis. These two offsetting factors provide some assurance that this analytical approach is capable of producing a reasonable estimate of commercial recycling.

When the estimate of 223,000 tons of commercial recycling is combined with the estimate of 390,800 tons of commercial waste disposed, a commercial recycling rate can be determined. This rate is approximately 36 percent (223,000 divided by the sum of 390,800 and 223,000). This is very close to the 35 percent estimated based on a qualitative assessment of commercial recycling, which provides an additional level of confidence regarding the reasonableness of this estimate.

5-3 PROJECTIONS OF WASTE GENERATION, RECYCLING, COMPOSTING AND DISPOSAL

With the starting points for the projections of municipal and commercial waste quantities established, the projections can be performed. There are numerous factors that can affect the amounts of waste generated, recycled, composted and disposed, and these projections take into account the most significant of those factors. Waste generation is affected primarily by population, employment and trends in waste generation rates per capita or per employee. Recycling is affected by collection and processing costs and logistics, revenue potential, future marketability, and the ability and willingness of people to perform the tasks necessary to recycle materials. Composting is affected primarily by the ability to collect compostable material, establishment of the sites or facilities necessary to compost the material, and the willingness of the public to comply with the requirements for separation of the material. All of these factors are considered in the projections described below.

5-3-1 Municipal Waste Projections

The key assumptions utilized in the projection of municipal waste generation and recycling are shown in Table 171-5 (3). The 1994 waste generation rate was estimated to be approximately 0.47 tons per person per year. This rate is projected to increase 0.5 percent per year from 1994 through 2000. This increase in rate is significantly lower than the long-term historical average based on recent apparent success in reducing waste generation rates. The rate of increase is projected to continue to decline, based on future source reduction efforts, so that in the period 2011 through 2015 the per-capita waste generation rate is estimated to remain constant.

The projected per-capita waste generation rates are applied to the statewide population projected by the Statewide Planning Program. The projected population levels and the resulting projections of municipal waste generation are shown in Table 171-5 (4). It can be seen that municipal waste generation is projected to increase from 483,500 tons in 1994 to 532,700 tons in 2015.

Table 171-5 (3) also shows material-by-material recycling projections. The 1994 data is from records from the RISWMC MRF, which is then compared to the estimated amount of each material generated in 1994. The amount of material generated is based on the 1991 composition study, applied to the 1994 estimate of total municipal waste generated. This data is shown in Table 171-5 (5). For each material, increases in the recycling rate from the 1994 levels are projected. The projected recycling rates by material were developed by consensus through consultation with recycling staff from

DEM and the Corporation. The rationale for the trend for each material is summarized below. It should be noted that the projected rates reflect diversion from landfill, and include all material diverted through scavenging, and are also net of any residue created during processing.

Newspaper - As newspaper recycling becomes increasingly institutionalized, and programs for its collection become more effective, recovery rates are expected to increase from the already relatively high 65 percent recovery level. Recovery rates above 90 percent are very hard to achieve due to the compounding effects of participation rates and separation efficiency. A 90 percent diversion rate would require that 95 percent of the population participate in newspaper recycling and that all participants separate, on average, 95 percent of the newspaper they generate.

Table 171-5 (3)

TABLE 171-5 (3)
MATERIAL-BY-MATERIAL RECYCLING PROJECTIONS

PROJECTION ASSUMPTIONS				
	1994	1995	2010	2015
POPULATION INCREASE ABOVE DOP PROJ.		0.0%	0.0%	0.0%
EMPLOYMENT INCREASE ABOVE PROJECTION		0.0%	0.0%	0.0%
WASTE GENERATION RATE INCREASE		0.5%	0.1%	0.0%
COMMERCIAL RECYCLING C & D RECYCLING RATE		60.0%	90.0%	90.0%
YARD WASTE COMPOSTING RATE		50.0%	95.0%	95.0%
OTHER RECYCLING RATE		25.0%	45.0%	50.0%
TOTAL COMM. RECYCLING RATE (1)		36.6%	61.9%	65.0%
RESIDENTIAL WASTE RECYCLING/COMPOSTING DIVERSION RATES (2)	1994	1995	2010	2015
PAPER				
Newspaper	65.2%	75.0%	85.0%	90.0%
Mixed Ledger/Mail	0.7%	2.0%	75.0%	80.0%
Corrugated Cardboard	0.0%	2.0%	70.0%	75.0%
Magazines		3.0%	75.0%	80.0%
Chipboard/Paperboard		0.8%	70.0%	70.0%
Telephone Directories		10.0%	85.0%	90.0%
Kraft Paper	0.9%	25.0%	70.0%	75.0%
Milk/Drink Cartons		0.5%	70.0%	75.0%
Other Poly-Coated Containers		0.0%	10.0%	15.0%
Books		0.0%	70.0%	70.0%
PLASTIC				
PET	44.2%	55.0%	75.0%	80.0%
Translucent HDPE	57.4%	60.0%	75.0%	80.0%
Other Rigid Plastics		10.0%	40.0%	50.0%
Film Plastics		0.5%	7.5%	10.0%
METAL				
Tin-coated Cans	41.8%	45.0%	70.0%	75.0%
Other Ferrous (incl. aerosols)		2.0%	50.0%	60.0%
Aluminum containers	23.7%	45.0%	75.0%	75.0%
Other Aluminum		10.0%	70.0%	75.0%
Other Non-ferrous		2.0%	50.0%	60.0%
GLASS CONTAINERS	40.3%	45.0%	80.0%	80.0%
ORGANICS				
Leaves	40.0%	50.0%	95.0%	95.0%
Grass/Other	10.0%	15.0%	95.0%	95.0%
Food Waste		0.0%	30.0%	50.0%
Wood		0.5%	40.0%	50.0%
TEXTILES		10.0%	70.0%	75.0%

NOTES:

(1) Based on assumption that 25 percent of commercial waste is construction and demolition debris, 11.2 p and remainder is "other" waste (per Waste Composition Study).

(2) Projections of residential recycling are net of residue and include recycling which occurs outside of the scavenging).

Table 171-5 (4)

TABLE 171-5 (4)

	PROJECTED POPULATION AND MUNICIPAL WASTE GENERATION AND RECYCLING				
	DOP	WASTE		MUNICIPAL	
	STATEWIDE POPULATION	WASTE GENERATED	RECYCLED/ COMPOSTED	WASTE DISPOSED	RECYCLING RATE
1985	967,910				
1986	975,021				
1987	982,132				
1988	989,242	479,275	5,631	473,644	
1989	996,353	554,451	32,116	522,335	
1990	1,003,464	494,710	45,929	448,781	9.3%
1991	1,007,268	525,168	49,774	475,394	9.5%
1992	1,011,072	496,576	51,328	445,248	10.3%
1993	1,014,876	478,528	52,993	425,536	11.1%
1994	1,018,680	483,526	65,672	417,854	13.6%
1995	1,022,484	487,758	76,329	411,429	15.6%
1996	1,025,467	491,627	94,187	397,440	19.2%
1997	1,028,450	495,523	112,045	383,478	22.6%
1998	1,031,433	499,445	129,902	369,542	26.0%
1999	1,034,416	503,394	147,760	355,633	29.4%
2000	1,037,399	507,369	165,618	341,751	32.6%
2001	1,039,683	509,758	172,844	336,914	33.9%
2002	1,041,967	512,155	180,069	332,085	35.2%
2003	1,044,251	514,561	187,295	327,265	36.4%
2004	1,046,535	516,975	194,521	322,454	37.6%
2005	1,048,819	519,399	201,747	317,652	38.8%
2006	1,050,996	520,997	206,731	314,266	39.7%
2007	1,053,173	522,599	211,716	310,883	40.5%
2008	1,055,350	524,203	216,701	307,502	41.3%
2009	1,057,527	525,809	221,686	304,124	42.2%
2010	1,059,704	527,418	226,670	300,748	43.0%
2011	1,061,881	528,502	230,253	298,249	43.6%
2012	1,064,058	529,585	233,836	295,749	44.2%
2013	1,066,235	530,669	237,419	293,250	44.7%
2014	1,068,412	531,752	241,002	290,751	45.3%
2015	1,070,253	532,669	244,585	288,084	45.9%

ALL QUANTITIES IN TPY

Table 171-5 (5)

MUNICIPAL WASTE PROJECTIONS	PRE-RECYCLING 1995	1995	1995	1995
WASTE COMPONENT	MUNICIPAL WASTE COMPOSITION	MUNICIPAL WASTE GENERATED	MUNICIPAL WASTE RECYCLED	POST-RECYCLING WASTE QUANTITIES
PAPER				
Newspaper	10.30%	50,239	37,679	12,560
Office Paper	2.60%	12,682	254	12,428
Cardboard	2.95%	14,389	288	14,101
Magazines	2.30%	11,218	337	10,882
Chipboard	3.70%	18,047	90	17,957
Telephone Directories	0.23%	1,132	113	1,019
Kraft Paper	2.95%	14,389	3,597	10,792
Milk/Drink Cartons	0.45%	2,195	11	2,184
Other Poly-Coated Containers	0.25%	1,219	0	1,219
Books	0.10%	488	0	488
Other Paper	8.07%	39,352	0	39,352
Subtotal	33.90%	165,350	42,369	122,981
PLASTICS				
PET	0.50%	2,439	1,341	1,097
Translucent HDPE	0.40%	1,951	1,171	780
Other Rigid Plastics	1.00%	4,878	488	4,390
Film Plastics	3.60%	17,559	88	17,472
Other Plastics	3.30%	16,096	0	16,096
Subtotal	8.80%	42,923	3,088	39,835
ORGANICS				
Leaves	2.90%	14,145	7,072	7,072
Stumps	0.30%	1,463	219	1,244
Grass/Other	6.20%	30,241	4,536	25,705
Fines	4.00%	19,510	0	19,510
Wood	0.50%	2,439	12	2,427
Food Waste	7.00%	34,143	0	34,143
Other Organics	16.10%	78,529	0	78,529
Subtotal	37.00%	180,471	11,840	168,630
GLASS				
Containers	4.90%	23,900	10,755	13,145
Other Glass	0.10%	488	0	488
Subtotal	5.00%	24,388	10,755	13,633
METAL				
Tin-coated Cans	1.80%	8,780	3,951	4,829
Other Ferrous	2.40%	11,706	234	11,472
Aluminum Containers	0.70%	3,414	1,536	1,878
Other Aluminum	0.30%	1,463	146	1,317
Other Non-ferrous	0.20%	976	20	956
Subtotal	5.40%	26,339	5,887	20,452
OTHER WASTES				
Textiles	4.90%	23,900	2,390	21,510
Tires	0.20%	976	(1)	976
Disposable Diapers	3.10%	15,121	0	15,121
Inorganics	1.20%	5,853	0	5,853
Subtotal	9.40%	45,849	2,390	43,459
HHW	0.50%	2,439	0	2,439
TOTAL	100.00%	487,758	76,329	411,429

Mixed Ledger/Mail - The expanded MRF that is currently under development will have the capability of handling a much larger variety and quantity of paper than is currently processed at the MRF. As a result, mixed ledger/mail can be included in recycling programs once the expanded MRF is operational. This is the reason for the large jump in recovery from 1995 to 2000. The marketability of this material is projected to be excellent for the foreseeable future, so collection programs and participation rates will be the major limiting factors for this material. This recovery will tend to lag behind that of newspaper, which has been recycled on a large scale basis for a considerable period of time.

Corrugated Cardboard - Corrugated cardboard will also be handled at the expanded MRF, and the issues regarding its marketability and collection are virtually identical to those for mixed ledger/mail. However, the preparation required by residents is generally greater for corrugated than other grades of material (i.e. cutting and bundling material). As a result, recovery rates projected are lower than those for mixed ledger/mail.

Magazines - The projections and the rationale are the same as for mixed ledger/mail.

Chipboard/Paperboard - Chipboard/paperboard will be handled at the expanded MRF, so its recovery is expected to jump after 1995. The marketability of this material is projected to be somewhat lower than that of mixed ledger or corrugated cardboard. In addition, this material has not generally been recognized as being recyclable, in the way that corrugated cardboard or newspaper has. As a result, chipboard/paperboard recovery levels are projected to be the same as those for corrugated cardboard, but to peak at a lower level.

Telephone Directories - Until telephone directories can be accepted at the expanded MRF, it is impractical to collect them in a curbside program, resulting in the big jump in recovery after 1995. Since telephone directories have the ability to be self-promoting in terms of their recyclability, and the marketability is good, recovery rates are projected to be high.

Kraft Paper - The 1994 diversion rate for kraft paper is artificially low, since it only includes that material which was marketed separately as kraft paper. Much of the newspaper delivered to the MRF is in kraft bags, but depending on the market for kraft paper, the bags are separated from the newspaper or not. As a result, it is estimated that a larger fraction of the kraft paper generated was recycled in 1994 than is indicated by the data from the MRF, and this is reflected in the 1995 projection. With the expanded MRF, kraft paper will be sought more aggressively as a recyclable material in its own right. As a result, recovery rates are projected to increase significantly.

Milk/Drink Cartons - This material is slated for collection as part of the expanded municipal recycling program. It will be collected along with mixed bottles and cans, not with mixed paper. Corporation staff will seek opportunities to include additional polycoated paper packages in this category, as markets develop and technologies change.

Books - Books can be recycled at the expanded MRF, and thus after 1995 recovery is expected to be initiated. However, this is not a material that has been historically recycled, and thus it is likely to take longer for public acceptance of recycling of books. This is the reason for the lower recovery level in 2000 than most of the other paper grades. After that time, the recovery rates are expected to be the same as chipboard/paperboard.

PET - The marketability of PET is excellent, and participation and efficiency rates are expected to improve over time, so the diversion rate is expected to increase from the current 44 percent to 80 percent by 2015.

Translucent HDPE - This material is expected to follow the same trend as PET, but currently has a higher diversion rate. Therefore, in the early years translucent HDPE is expected to have a slightly higher diversion rate than PET, but these are expected to even out.

Other Rigid Plastics - The most marketable component of other rigid plastics is pigmented HDPE, and this material will likely be included in curbside collection programs once the expanded MRF is on-line. Based on the 1991 composition study, pigmented HDPE represents about one-third of the other rigid plastics category. Thus, other plastics would have to be included to exceed a 33 percent diversion rate for this category. It is expected that the marketability of other plastic resins will improve in the future, which is the basis of diversion rates reaching 50 percent by 2015.

Film Plastics - While a market for film plastics exists, the requirements for lack of contamination, along with the logistics of collecting, storing and processing this low-density and multi-resin material mean that recovery is likely to be limited to store-based programs to collect used bags and cleaning films. This is the reason for the relatively low projected diversion rates.

Tin-coated Cans - The marketability of tin cans is projected to remain excellent, and collection and processing are in-place. Therefore, diversion is limited primarily by participation and recovery efficiency. The need to clean tin cans is a significant obstacle that will continue to limit diversion, although public acceptance of this practice is expected to grow, allowing diversion to increase.

Other Ferrous - This material will be sought more aggressively after the expansion of the MRF, with the targeting of aerosol containers, paint cans, and household scrap metals being a specific objective. Due to the need to educate the public about the recyclability of these materials, the diversion rate is projected to lag behind tin cans.

Aluminum Containers - The 24 percent diversion rate calculated for 1994 reflects only that material that was received at the MRF, and it is known that a significant amount of aluminum is scavenged from curbside collection containers prior to collection. As a result, when this factor is taken into account the diversion rate is estimated to be approximately 45 percent, as reflected in the 1995 projection. The jump from 24 to 45 percent does not represent an increase in recycling level, just an accounting for material scavenged. The high value of this material means this activity is likely to continue, and diversion rates are expected to increase.

Other Non-ferrous - See other ferrous.

Glass Containers - The current high diversion rate for this material is expected to increase, with a significant increase in diversion occurring as a result of an expected reduction in residue generation when the expanded MRF is operational. Currently a significant portion of glass delivered to the MRF is broken or breaks during processing, making separation difficult. Thus, most of this broken glass is not actually recycled, but ends up as residue that is disposed. Since the rates shown in the table reflect what is actually recycled, net of residue, this loss of material decreases the diversion rate. The expanded MRF will have equipment designed to recover broken glass for recycling, which is the reason for the jump in diversion level from 1995 to 2000.

Leaves - Leaf composting is expected to increase dramatically over the next several years, as communities respond to anticipated restrictions on combined collection of leaves and garbage. It is expected, however, that regardless of the level of education and separate collection, some small fraction of leaves will end up being disposed, which is the rationale for the maximum diversion rate of 95 percent.

Grass/Other Yard Waste - Grass is lagging behind leaves in separate collection and composting, but it is believed that eventually it will achieve the same high level of diversion. It should be noted that practices such as mulch mowing and other "grass cycling" techniques, which eliminate the need for management of this material, are accounted for in the reduction of increases in waste generation rates over time.

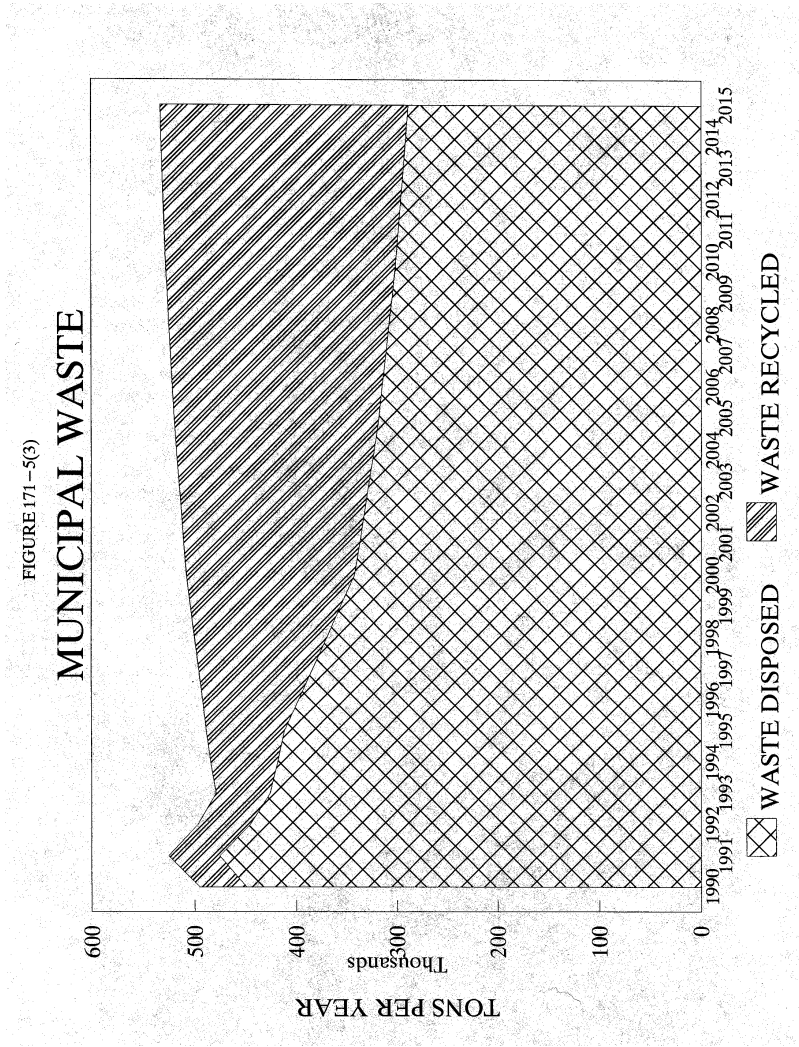
Food Waste - Food waste is very compostable, but the requirements for collection and processing are greater than for yard waste. In addition, the separation of material required by residents in order to preserve the compostability of this waste stream is a major obstacle to its widespread diversion. Nonetheless, the possibility exists for development of so-called wet/dry collection schemes, in which all compostable material is collected commingled, easing the collection and separation requirements. It is with this possibility in mind that recovery rates are projected to increase in the latter half of the projection.

Wood - It is expected that in some communities wood could be included in a yard waste collection program, since it can be handled in the same manner as brushy yard waste. However, the need for relatively clean material is expected to limit diversion rates. Household scrap wood will be a target for expanded recycling programs and the expanded MRF will be equipped to handle this material.

Textiles - A more centralized approach to recovery of textiles is expected as part of the programs associated with the expanded MRF. Thus, recovery is expected to increase significantly.

When these material-by-material diversion rates are applied to the municipal waste composition, total recycling/composting rates can be determined. As shown in Table 171-5 (3), the total statewide recycling rate is projected to increase from 13.6 percent in 1994 to 45.9 percent in 2015. When the total amount of material projected to be recycled and composted each year is subtracted from the total amount of waste projected to be generated, the amount of waste disposed is projected. It can be seen that municipal waste disposal is projected to decrease from 417,900 tons in 1994 to 288,100 tons in 2015. This projected dramatic reduction is shown graphically in Figure 171-5 (3).

Figure 171-5 (3)



5-3-2 Commercial Waste Projections

Commercial waste generation is projected in exactly the same fashion as municipal waste generation, with the only difference being that employment is used as the key factor instead of population. In 1995, it is estimated that 615,900 tons of commercial waste will be disposed. With an estimated statewide employment of 489,800, the commercial waste generation rate is 1.26 tons per employee per year. This rate is projected to increase in the same fashion as the municipal waste generation rate: 0.5 percent per year from 1995 to 2000, 0.3 percent per year from 2001 through 2005, 0.1 percent per year from 2006 through 2010, and no increase from 2011 through 2015.

The commercial waste generation rate is then applied to the projected statewide employment for each year, as shown in Table 171-5 (6). The projected employment was provided by the Statewide Planning Program. Commercial waste generation is projected to increase from 615,900 tons in 1995 to 682,500 tons in 2015.

The lack of accurate commercial waste composition data, along with a much less detailed understanding of the types and quantities of commercial waste being recycled than municipal waste being recycled means that a different approach must be used for projecting commercial recycling than for projecting municipal recycling. In order to facilitate the projection of commercial recycling, the commercial waste stream was considered in terms of its three major components: construction and demolition debris, yard waste, and other material. Based on the composition study done in 1991, construction and demolition waste was estimated to be 25 percent of the commercial waste stream, and yard waste was 11 percent.

Table 171-5 (6)

TABLE 171-5 (6)

	PROJECTED EMPLOYMENT AND COMMERCIAL WASTE GENERATION AND RECYCLING				
	DOP	WASTE GENERATION	QUANTITY		COMMERCIAL
	STATEWIDE EMPLOYMENT		RECYCLED	DISPOSED	RECYCLING RATE
1985	442,914				
1986	448,596				
1987	454,278				
1988	459,961				
1989	465,643				
1990	471,325	455,475	113,869	341,606	25.0%
1991	475,018	487,566	133,154	354,412	27.3%
1992	478,711	519,657	153,923	365,735	29.6%
1993	482,403	551,748	176,173	375,575	31.9%
1994	486,096	583,840	199,907	383,933	34.2%
1995	489,789	615,931	225,123	390,808	36.6%
1996	493,365	623,652	240,630	383,022	38.6%
1997	496,941	631,373	256,451	374,922	40.6%
1998	500,517	639,094	272,586	366,508	42.7%
1999	504,093	646,815	289,036	357,779	44.7%
2000	507,669	654,536	305,799	348,737	46.7%
2001	509,298	658,307	319,990	338,317	48.6%
2002	510,927	662,078	334,323	327,755	50.5%
2003	512,555	665,849	348,798	317,051	52.4%
2004	514,184	669,620	363,416	306,204	54.3%
2005	515,813	673,391	378,176	295,215	56.2%
2006	516,250	674,640	386,555	288,085	57.3%
2007	516,688	675,888	394,962	280,926	58.4%
2008	517,125	677,137	403,397	273,739	59.6%
2009	517,563	678,385	411,861	266,524	60.7%
2010	518,000	679,634	420,354	259,280	61.9%
2011	518,437	680,208	425,048	255,160	62.5%
2012	518,875	680,782	429,750	251,031	63.1%
2013	519,312	681,356	434,460	246,896	63.8%
2014	519,750	681,930	439,176	242,753	64.4%
2015	520,187	682,503	443,900	238,603	65.0%

The 36 percent overall commercial recycling rate estimated for the current conditions was converted to recycling rates for these three components of commercial waste, as shown in Table 171-5 (7). Analyses of the construction and demolition debris waste stream in Rhode Island have revealed a very high recycling rate, so this was estimated at 60 percent currently. Commercially generated yard waste is often composted due to the potential disposal cost savings, so this activity was estimated at 50 percent diversion. The other commercial waste recycling rate was estimated such that the total combined recycling rate would be approximately 36 percent, as previously estimated. A 25 percent other-commercial-waste recycling rate yields a combined 36.6 percent recycling rate.

Increases in recycling rates were then projected for each component. Construction and demolition debris recycling is expected to continue to increase as this becomes a more accepted and standard practice. However, some fraction of the material is not well suited to recycling, meaning that diversion rates are expected to peak at 90 percent. Commercial yard waste composting will increase in the same fashion as municipal yard waste composting, and the increasing availability of facilities to compost that material will facilitate that increase. The recycling of other commercial waste will also increase significantly, driven largely by the projected increase in recovery of commercially-generated waste paper. The combined effect of these assumptions is that total commercial recycling will increase to 65 percent by 2015.

These projected overall recycling rates are applied to the projected level of commercial waste generation, as shown in Table 171-5 (6). This increase in recycling results in a projected decrease in commercial waste disposal from 390,800 tons in 1995 to 238,600 tons in 2015. This is shown graphically in Figure 171-5 (4).

5-3-3 Combined Waste

When the results of the municipal and commercial waste projections are combined, the levels of generation, recycling and disposal for the combined waste stream can be determined. These results are shown in Table 171-5 (8) and Figure 171-5 (5).

Table 171-5 (7)

TABLE 171-5 (7)
PROJECTED COMMERCIAL RECYCLING RATES

PROJECTION ASSUMPTIONS	1994	1995	2000	2005	2010	2015
COMMERCIAL RECYCLING						
C & D RECYCLING RATE		60.0%	70.0%	80.0%	90.0%	90.0%
YARD WASTE COMPOSTING RATE		50.0%	90.0%	95.0%	95.0%	95.0%
OTHER RECYCLING RATE		25.0%	30.0%	40.0%	45.0%	50.0%
TOTAL COMM. RECYCLING RATE		36.6%	46.7%	56.2%	61.9%	65.0%

Table 171-5 (8)

TABLE 171-5 (8)

	PROJECTED COMBINED WASTE GENERATION AND RECYCLING			
	WASTE GENERATION	QUANTITY RECYCLED	DISPOSED (POST- RECYCLING)	RECYCLING RATE
1985				
1986				
1987				
1988				
1989				
1990	950,185	159,798	790,387	16.8%
1991	1,012,734	182,928	829,806	18.1%
1992	1,016,233	205,251	810,982	20.2%
1993	1,030,277	229,166	801,111	22.2%
1994	1,067,366	265,579	801,787	24.9%
1995	1,103,689	301,452	802,237	27.3%
1996	1,115,279	334,817	780,462	30.0%
1997	1,126,895	368,496	758,400	32.7%
1998	1,138,539	402,489	736,050	35.4%
1999	1,150,209	436,796	713,413	38.0%
2000	1,161,906	471,417	690,488	40.6%
2001	1,168,065	492,834	675,231	42.2%
2002	1,174,233	514,392	659,840	43.8%
2003	1,180,410	536,094	644,316	45.4%
2004	1,186,595	557,937	628,658	47.0%
2005	1,192,790	579,923	612,867	48.6%
2006	1,195,637	593,286	602,351	49.6%
2007	1,198,487	606,678	591,809	50.6%
2008	1,201,339	620,098	581,241	51.6%
2009	1,204,195	633,547	570,648	52.6%
2010	1,207,053	647,024	560,029	53.6%
2011	1,208,710	655,302	553,408	54.2%
2012	1,210,367	663,586	546,781	54.8%
2013	1,212,025	671,879	540,146	55.4%
2014	1,213,682	680,178	533,504	56.0%
2015	1,215,172	688,485	526,687	56.7%

ALL QUANTITIES IN TPY

Figure 171-5 (4)

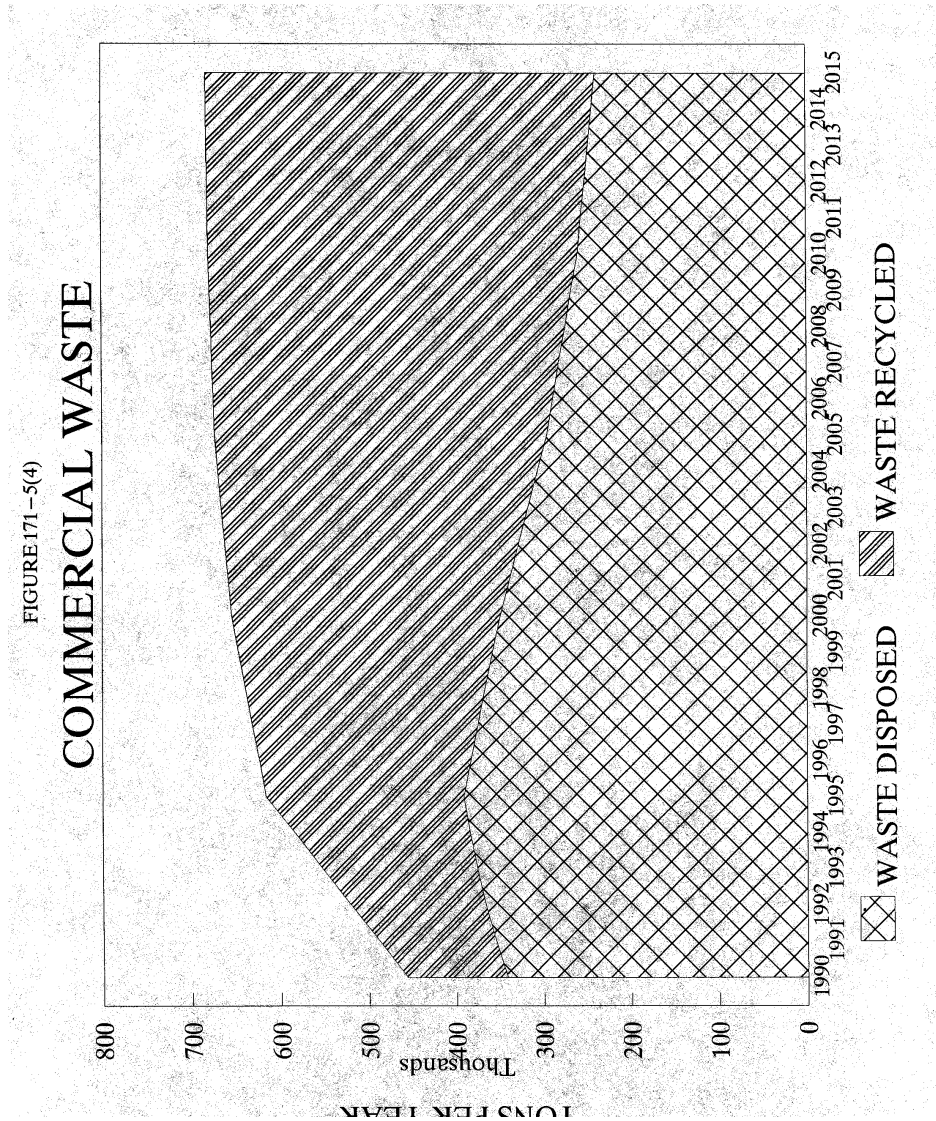


Figure 171-5 (5)

